New laboratory for the study of irradiated materials associated to RA10 Research Reactor in Argentina

Rubén O. González, Marcela I. Mirandou, Constanza Lugo, Aníbal Rodriguez, Pablo Areas, Evangelina De Las Heras, Lucio Ponzoni and Yasmin Martínez

Comisión Nacional de Energía Atómica, Ciudad Autónoma de Buenos Aires, Argentina
Corresponding author: Ruben O. González <rugonz@cnea.gov.ar>

Currently Argentina has the experience and capacity for the design, construction, commissioning and operation reactors for research, development and production of radioisotopes, such as the RA-10 reactor, which construction is in progress. In the same way, during the last years our country has accomplished the knowledge to design and build the facilities needed to enhance the use of RA10 reactor through its multiple capabilities.

One of the main objectives of *RA10* reactor is the research and development of new nuclear fuels and materials. To fulfill this task, it is mandatory the existence of a facility in which the post irradiation examinations, studies and tests can be done. In this sense, a project has been initiated in CNEA which aim is the construction of a new *Laboratory for the Study of Irradiated Materials*.

This Laboratory will be destined to carry out tests and characterization of irradiated fuels and materials in a versatile and adequate way through specific and complex studies. It will be equipped with high technological level equipment applied to several analysis techniques such as, Optical Microscopy, Scanning Electron Microscopy, Quantitative Dispersive Microanalysis in Energy and Wavelength, X-ray Diffraction, among others.

Technical description

The proposed plant distribution for this laboratory (Figure 3) is composed by a main warehouse divided into four sectors: Office Sector, Equipment-Operation Sector, Intervention Sector and Hot Cells Sector.

In the Office Sector, there will be a main access road for the entry of personnel, while in the Intervention Sector a secondary access road destined to the entry of transport packages.

In the Equipment-Operation Sector, the characterization equipment will be housed. The equipment considered necessary for a proper analysis and characterization of the irradiated samples are a scanning electron microscope, a X-ray diffractometer and an electron microprobe analyser. This sector will have sufficient free space, in case the use of other equipment would be required in specific practices. Each equipment will have associated a workstation for technicians and / or users of it. There will also be support workstations with tools for repairing or making specific devices needed during the development of different experiences.

This sector will also have a Mock up cell for training and testing of procedures and the general control room of the Hot Cell, Equipment-Operation and Intervention sectors (controls, commands and electrical protections of the laboratory).

In the Intervention Sector, the samples coming from the reactor in their corresponding containers will be received. It will also have a depot for irradiated samples, a shielded locker for small equipment

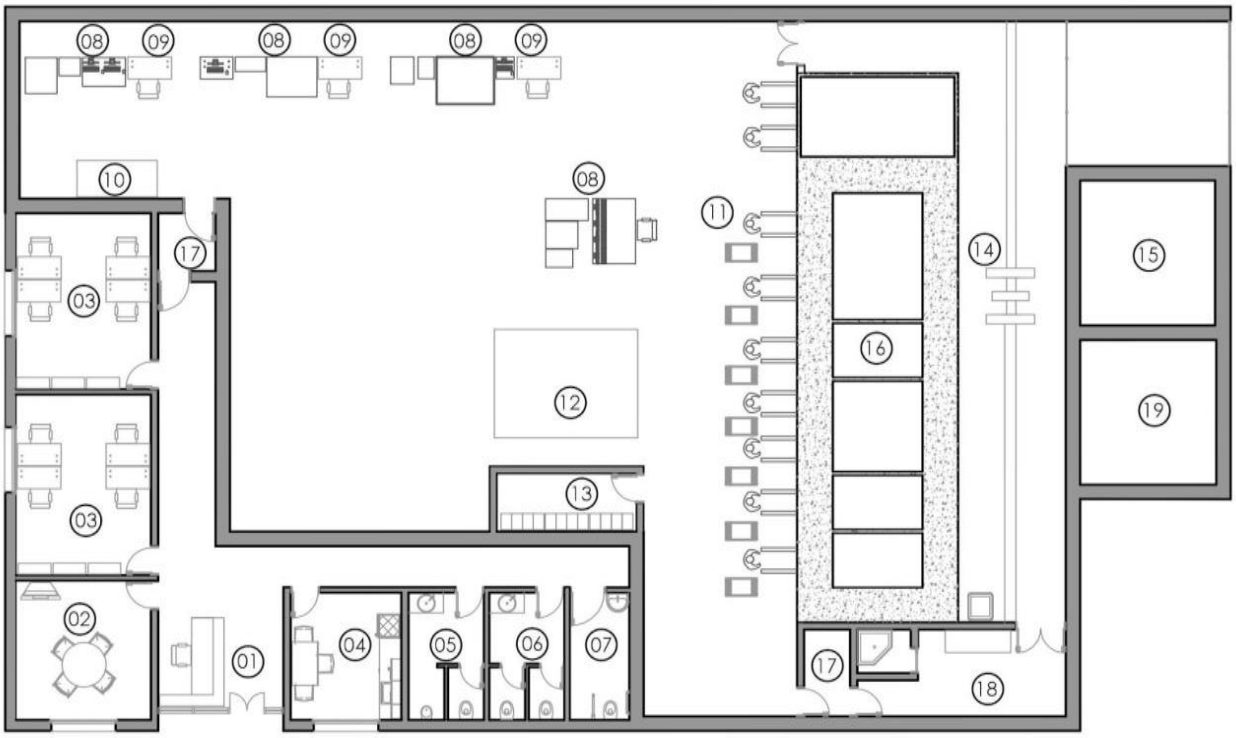
used inside the cells, which are taken out in order to free the different cells. Also a small room to contain radioactive waste, temporarily, will be placed in this sector.

The Hot Cells Sector will consist of six αβγ shielded compartments, in which highly radioactive materials can be handled. The entire assembly will have adequate perimeter shielding for an equivalent Co_{60} activity of approximately 10^5 Ci.

The work premise is based on the minimization of the samples, their preparation according to the requirements of the different characterization techniques and the conditioning for their extraction from the cell and subsequent analysis. As this laboratory has been thought to carry out both research and development activities, a versatile and comprehensive conceptual design is necessary. Thus, the cells will have different internal sizes with the aim of adapting them to the greater number of activities and required equipment.

In the following paragraphs a brief description of the functionality of each of the six proposed compartments is presented

- *Compartment 1*: Its main function will be the handling of large components. It will have an approximate width of 3 m and double pair of telemanipulators. These two workstations can be used individually or combinated. It will have gates of important dimensions to allow the entry of devices.
- *Compartments 2 and 3*: The main function will be the development of activities that require the use of equipment of reduced dimensions. It will have an approximate width of 1.5 m and a single pair of telemanipulators.
- *Compartment 4*: Its main function will be metallographic preparation of samples. Inside it, cutting, polishing, ultrasonic cleaner machines, among others, will be housed. It will have an approximate width of 2.5 m and double pair of telemanipulators to work independently or in combination.
- *Compartment 5*: It will contain an optical microscope. It will also have free space available to house auxiliary equipment for common use or equipment from other compartments that require a temporary stay inside the cells. Its width will be 1.5 m, approximately, and will have one pair of telemanipulators.
- *Compartment 6*: It will contain the column of an electron microprobe analyser.



1. Central hall,
2. Meeting room,
3. Offices,
4. Kitchenette,
5-7. Rest rooms,
8. Characterization Equipment,
9. Equipment workstations,
10. Tools cabinet,
11. Hot cells workstations,
12. Mock up,
13. Hot cells control room,
14. Crane,
15. Equipment and irradiated samples room,
16. Hot cells,
17. Airlock,
18. Dressing room,
19. Radioactive waste room

Figure 3: Proposed plant distribution for the new *Laboratory for the Study of Irradiated Materials.*

Reference

“Guía general de presentación de proyectos de inversión”, cp-cnea-2015-gui002rev.: 0. Cnea. 2018